Experimentation of Shock Wave Interaction with Water

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Abstract: The dissemination of shock waves through any medium results in change in the property on fluids, this is because of the characteristics of the shock wave. This paper deals with shock wave interaction on fluids. The strength of the shock is determined by its mach number. Initially the experiment is carried in water sample taken from our institute location. The experiment is done by changing the number of shockwaves.From our initial experimental results we found that change in salinity content of the water . On Continuing this idea, we are trying to carry out experiments on shock treated water to find mineral changes.

Index Terms- Shock wave, Water sample, Shock Tube, Salinity

I. INTRODUCTION:

Shock wave, strong pressure wave in any elastic medium such as air, water, or a solid substance, produced by supersonic aircraft, explosions, lightning, or other phenomena that create violent changes in pressure. Shock waves differ from sound waves in that the wave front, in which compression takes place. Because of this, shock waves propagate in a manner different from that of ordinary acoustic waves. In particular, shock waves travel faster than sound, and their speed increases as the amplitude is raised. Shock Wave obeys laws of acoustic wave.

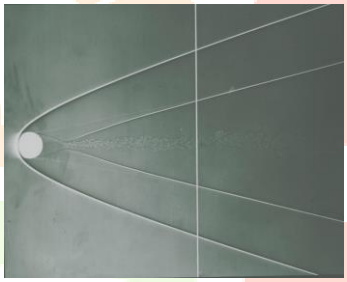

fig 1.1: shock wave

Shock Tube:

The shock tube is an instrument used to replicate and direct blast waves at a sensor or a model in order to simulate actual explosions and their effects, usually on a smaller scale. A shock tube consists of a long metal tube with two sections, one at high pressure (the driver section) the other at lower pressure (the driven section). A diaphragm separates the two sections as illustrated in the Figure 1.2. A sharp plunger is used to rupture the diaphragm after the desired pressure conditions have been set. Once the diaphragm is ruptured, shock wave travel in the shock tube.

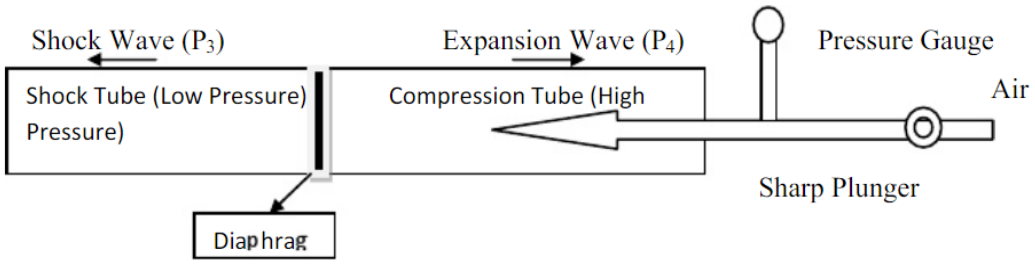

fig 1.2: Block diagram of Shock Tube

Shock Tube Parameters:

Name of the manufacturer	Srusthi Education System pvt. Ltd., Bangalore, India.
Material of tube	Stainless steel
Inner Diameter of tube	0.03 m
Length of tube	1 m
Length of driver section	0.4 m
Length of driven section	0.6 m
Thickness of diaphragm	0.1 mm
Material of diaphragm	Trade name – Mylar or Tracing paper Chemical name – Polyethylene terephthalate (PET)
Shock wave strength (P_2/P_1)	2.0

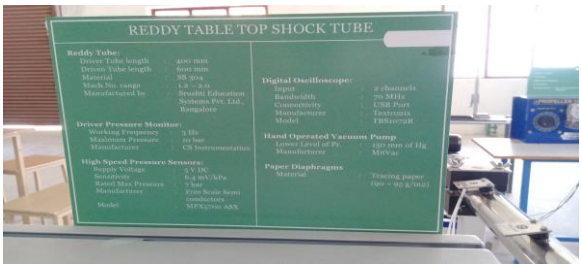

fig 1.3: characteristics of shock tube

Constraints of the shock tube is that, we cannot impinge the shock wave directly in water because of its horizontal design. A coupling containing this elbow and washer is used to overcome this constraint. The Expansion wave from the elbow is assumed to be negligible as it has only minute impact on the specimen.

Coupling Arrangement:

fig 1.4: shock tube with coupling

II. Experimental Process:

Step 1: A transparent plastic container is taken and is filled with 250 ml of water
Step 2: The manufactured coupling is assembled with the Shock Tube for the experimentation purpose
Step 3: The Diaphragm (Tracing Paper) is shaped in the size of the opening of driven section where it is placed
Step 4: The hand piston is actuated and the shock is passed to the specimen
Step 5: The number of shock wave to be passed is determined and the step 3 & 4 is repeated until the desired amount of shock wave is passed
Step 6: The specimen is now taken and examined under various circumstances
Step 7: The results obtained are noted down and documented

III. Result:

Table 1.1: Results of the experiment

Number of Shock Waves	pH Value	Conductance Value
0	8.03	5.4
50	7.97	5.5
100	7.87	5.9

IV. Graphical Result:

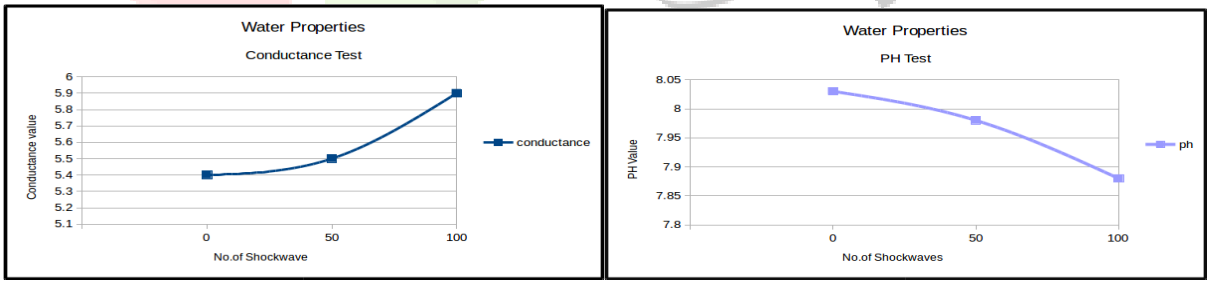

fig 1.5: Graphical representation of the results

V: Conclusion:

On examining the results, From pH test graph we come to know that salinity value get reduced by increasing the number of shockwaves. The salinity is inferred from the PH value.

From the result of Conductance test graph, the number of free molecules in the water sample increases which increases the conductance, this indicates that shock wave also acts as an energy source.

VI: Acknowledgement

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VII: References:

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